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Editorial

Left Ventricular Diastolic Function: The Link between CHA_2DS_2-VASc Score and Ischemic Stroke in Patients with Atrial Fibrillation

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▸ See the article "Cardiac structural or functional changes associated with CHA_2DS_2-VASc scores in nonvalvular atrial fibrillation: a cross-sectional study using echocardiography" in volume 26 on page 135.

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Atrial fibrillation (AF) is the most common form of arrhythmia, and it is associated with increased mortality and morbidity.[1)2)] AF significantly increases the risk for thromboembolic events, heart failure, hospitalization, and death. Ischemic stroke is the major cause of disability associated with AF. Therefore, various risk stratification strategies have been developed to quantify stroke risk in patients with AF and to guide strategies for clinicians to prevent the disability. The most widely used scoring system for risk estimation has been the $CHADS_2$ score, which calculates risks based on the presence of congestive heart failure, hypertension, age 75 years or greater, diabetes mellitus, and prior stroke or transient ischemic attack. A revision of the $CHADS_2$ score, which dichotomizes age and incorporates vascular disease and female sex, has been developed to create the CHA_2DS_2-VASc score; this score enhanced predictability among individuals with the lowest risk for AF.[3)]

Each factor of the CHA_2DS_2-VASc score represents the risk factor for ischemic stroke associated with AF. However, the mechanisms linking the clinical risk factors in CHA_2DS_2-VASc score to ischemic stroke have been incompletely defined. Most of the thrombi associated with AF originate in the left atrial appendage (LAA), and systemic embolization in AF usually originates from the LAA thrombi. Therefore, the contribution of clinical factors to ischemic stroke could be mediated by left atrium (LA) enlargement, which is largely associated with increase in LA pressure and LAA thrombosis. Traditionally, LA volume index has been known to be a morphologic expression of the severity and duration of left ventricular (LV) diastolic dysfunction. When LV filling pressure is elevated owing to diastolic dysfunction, LA enlargement may occur as a compensatory mechanism to maintain LA stroke volume, according to Frank–Starling's law.[4)] The clinical risk factors included in the CHA_2DS_2-VASc score, such as hypertension, diabetes, old age, congestive heart failure, and vascular pathology, can directly or indirectly influence LV diastolic function. Thus, the linkage between clinical risk factors and LAA thrombi may be mediated by LV diastolic dysfunction, which could affect the size and pressure of the left atrium/LAA.

In this issue of the journal, Jang et al.[5)] investigated the association between CHA_2DS_2-VASc score and echocardiographic LV structural/functional parameters in consecutive 4,795

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patients with nonvalvular AF. The authors showed that increasing CHA_2DS_2-VASc scores were associated with a high LV mass index, LA volume index, and E/E′, suggesting its association with diastolic dysfunction and increased LV filling pressure or LA pressure. E/E′, a ratio of early mitral inflow to mitral annulus velocity during early diastole, is known to be a reliable echocardiographic marker for LV filling pressure, and it is even applicable to patients with AF. While septal E/E′ ≥11 suggests elevated LV filling pressure in AF,[6] the mean value of E/E′ in the group of patients with CHA_2DS_2-VASc score 2–3 was 13; the value proportionally increased with increase in the CHA_2DS_2-VASc score, suggesting a stepwise increase in the LV filling pressure as the CHA_2DS_2-VASc score rises. The authors also showed that LA volume index continuously increased following the increase in CHA_2DS_2-VASc score, while its stepwise increase in the LA dimension at the anteroposterior direction was blunted in patients with CHA_2DS_2-VASc score more than 2. Herein, we can reconfirm the usefulness of the LA volume index over simple LA dimension in the assessment of LV diastolic function and LV filling pressure. The authors suggested that the underlying mechanism for this correlation is mediated by LV diastolic dysfunction, which is associated with clustering of demographic factors constituting the CHA_2DS_2-VASc score. Therefore, we can speculate that the cascade of LV diastolic dysfunction, LA enlargement, LA dysfunction, and finally LA thrombosis[7] is a plausible explanation for ischemic stroke in patients with high CHA_2DS_2-VASc score.

Current management of AF is mainly focused on the prevention of ischemic stroke with anticoagulation. However, congestive heart failure is an important disease observed in patients with AF, and patients with AF have 3 times more chances than normal individuals do, of developing congestive heart failure.[8] However, only limited data are available to help identify patients with AF who are at an increased risk for heart failure, whereas risk factors for stroke have been extensively evaluated, leading to the development of the CHA_2DS_2-VASc scoring systems to identify patients who might benefit from more intense anticoagulation therapy. The present study provides new therapeutic challenges on the management of AF by revealing the mechanisms of high CHA_2DS_2-VASc score causing ischemic stroke. The authors suggested that lowering the LV filling pressure can be a therapeutic target for nonvalvular AF with a high CHA_2DS_2-VASc score. However, data supporting this hypothesis are limited. Outcome data showing the prognostic implications of CHA_2DS_2-VASc score for diastolic heart failure are warranted. Management strategies other than anticoagulation warrant further investigation in patients with a high CHA_2DS_2-VASc score. In other words, the role of therapies that lower LV filling pressure through diuretics or vasodilators in patients with a high CHA_2DS_2-VASc score should be investigated further to secure the authors' hypothesis of the concomitant presence of high LA pressure in patients with a high CHA_2DS_2-VASc score. The exact association between CHA_2DS_2-VASc score and cardiac structure/function and the optimal method to improve outcomes in patients with AF remain to be determined.

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